Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Diabetes long-term complications admission: percentage of admissions for a principal diagnosis of diabetes with long-term complications per 100,000 population, ages 18 years and older.

Source(s)

AHRQ QI research version 5.0. Prevention quality indicator 3 technical specifications: diabetes long-term complications admission rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 2 p.

National Quality Forum measure information: diabetes long-term complications admission rate (PQI 03). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 17 p.

Measure Domain

Primary Measure Domain

Related Population Health Measures: Population Use of Services

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the percentage of admissions for a principal diagnosis of diabetes with long-term complications (renal, eye, neurological, circulatory, or complications not otherwise specified) per 100,000 population, ages 18 years and older.

Rationale

People with diabetes are prone to a variety long term complications associated with microvascular disease that may result in hospitalization, as well as long-term disability and death. The most common long-term complications, as targeted by this indicator include: 1) neuropathy, 2) vision disorders, and 3)

nephropathy. While these complications are varied, they all have the common source of longstanding poor glycemic control.

Improved access to ambulatory care can improve diabetic management including earlier diabetic case finding. Longstanding improvements in glycemic control and risk factor management can prevent or slow the progression of microvascular disease. This along with earlier complication identification and treatment can decrease or prevent hospitalizations related to these long-term diabetic complications.

There are several nationally accepted clinical guidelines (American Diabetes Association, 2013; Riethof et al., 2012; University of Michigan Health System, 2012; Department of Veteran Affairs & Department of Defense, 2010) that include major recommendations for screening and diagnosis, goals and treatment in the following areas related to long-term complications: nephropathy screening and treatment, retinopathy screening and treatment and neuropathy screening and treatment. These guidelines suggest that long-term complications are preventable and, thus, hospitalizations for these long-term complications are preventable.

This measure is an avoidable hospitalization/ambulatory care sensitive condition (ACSC) type indicator. ACSC type indicators are not measures of hospital quality, but rather measures of potentially avoidable hospitalization if appropriate outpatient care, other healthcare services or community services were accessed and obtained (i.e., measures of the health care system broadly defined). These measures are designed to assess population access to timely, high quality outpatient and public health services in a particular geographic area, for the purpose of managing chronic disease or diagnosing acute illnesses before progressing to inpatient treatment. These measures are of most interest to comprehensive health care delivery systems, such as some health maintenance organizations (HMOs), accountable care organizations (ACOs) or public health agencies. ACSC indicators correlate with each other and they may be used in conjunction as an overall examination of outpatient care and access to care at a national, regional or county level.

Evidence for Rationale

American Diabetes Association. Standards of medical care in diabetes - 2013. Diabetes Care. 2013 Jan;36(Suppl 1):S11-66. PubMed

Department of Veteran Affairs, Department of Defense. VA/DoD clinical practice guideline for the management of diabetes mellitus. Washington (DC): Department of Veteran Affairs, Department of Defense; 2010 Aug. 146 p.

National Quality Forum measure information: diabetes long-term complications admission rate (PQI 03). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 17 p.

Riethof M, Flavin PL, Lindvall B, Michels R, O'Connor P, Redmon P, Retzer K, Roberts J, Smith S, Sperl-Hillen J, Institute for Clinical Systems Improvement (ICSI). Diagnosis and management of type 2 diabetes mellitus in adults. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2012 Apr. 141 p. [198 references]

University of Michigan Health System. Management of type 2 diabetes mellitus. Ann Arbor (MI): University of Michigan Health System; 2012 Sep. 27 p. [17 references]

Primary Health Components

Diabetes; long-term complications (renal, eye, neurological, circulatory, or complications not otherwise specified); ambulatory care sensitive condition (ACSC)

Denominator Description

Population ages 18 years and older in metropolitan area or county (see the related "Denominator Inclusions/Exclusions" field)

Numerator Description

Discharges, for patients ages 18 years and older, with a principal International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code for diabetes with long-term complications (renal, eye, neurological, circulatory, or complications not otherwise specified) (see the related "Numerator Inclusions/Exclusions" field)

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

A systematic review of the clinical research literature (e.g., Cochrane Review)

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

As of 2010, an estimated 25.8 million people in the United States (U.S.) (or 11% of the population) over age 20 had diabetes, of which close to 40% were undiagnosed (Centers for Disease Control and Prevention [CDC], 2011). Diabetes is the leading cause of cause of new cases of blindness among adults and is the leading cause of both severe and moderate visual loss in working age Americans. Approximately 25% of patients with type 1 diabetes have retinopathy after five years, increasing to 60% and 80% after 10 and 15 years respectively. In 2005 to 2008, 4.3 million people with diabetes aged 40 and older (28.5% of all diabetics) had diabetic retinopathy, and of these, 655,000 (4% of those with diabetes) had an advanced stage (CDC, 2011). Diabetes is also the leading cause of kidney failure, accounting for 44% of all new cases of kidney failure in the U.S. In 2008 alone, 48,374 people with diabetes began treatment for end-stage kidney disease and 202,290 people with diabetes related end-stage kidney disease were living on chronic dialysis or with a kidney transplant (CDC, 2011). About 60% to 70% of people with diabetes have mild to severe forms of neuropathy ranging from peripheral neuropathy (the most common and the precursor to 50% to 75% of all non-traumatic amputations) to the most critical, cardiac autonomic neuropathy and hypoglycemia awareness autonomic failure (both of which may result in sudden death) (CDC, 2011).

Studies performed in the U.S. and abroad have found that improved glycemic control can prevent or lessen the impact of long-term complications in both type 1 and type 2 diabetics (Wang, Lau, & Chalmers, 1993; Diabetes Control and Complications Trial Research Group, 1993; United Kingdom Prospective Diabetes Study [UKPDS], 1995; American Diabetes Association [ADA], 2013). For every percentage point drop in glycosylated hemoglobin (hemoglobin A1c), reduces the risk of micro vascular complications by 40% (CDC, 2011). Blood pressure control reduces the risk of microvascular complications by 33% (CDC, 2011). Detecting and treating diabetic eye disease with laser therapy can reduce the development of severe vision loss by an estimated 50% to 60%. Comprehensive foot care programs (i.e., that include risk assessment, foot-care education and preventive therapy, treatment of foot problems, and referral to specialist) can reduce amputation rates by 45% to 85% (CDC, 2011; Wang, Lau, & Chalmers, 1993). Detecting and treating early diabetic kidney disease by lowering blood pressure can reduce the decline in kidney function by 30% to 70% (MacDonald et al., 2008). In addition to lowering

blood pressure, adding an angiotensin receptor blocker (ARB) and angiotensin-converting enzyme inhibitor (ACEI) reduce proteinuria, a risk factor for developing kidney disease, by about 35% (CDC, 2011).

Despite medical advances and increased awareness of diabetes in both the lay and medical communities, few patients with diabetes broadly achieve targets for glucose management and other preventative care interventions, as outlined in nationally accepted clinical guidelines (ADA, 2013). Access to quality outpatient care has been shown to decrease hospitalizations rates due to diabetes (Ahern & Hendryx, 2007; Chen et al., 2010), all though most studies looked at all-cause hospitalizations (Chen et al., 2010; Cheng, Lee, & Chen, 2012). Higher rates of hospitalization for long-term diabetic complications have been reported in zip codes with higher proportions of hospitalizations with no insurance or Medicaid insurance and with higher hospitalizations rates for hyperglycemic complications (Ward, 2009). A shortage of primary care physicians has been shown to correspond with reduced performance on Healthcare Effectiveness Data and Information Set (HEDIS) measures; whereas living in a state with higher Medicaid reimbursement fees and department of mental health expenses per client were associated both with higher quality on HEDIS measures and lower (better) rates of ambulatory care sensitive hospitalizations (Druss et al., 2012).

A review of 51 studies from the U.S. and the United Kingdom confirmed that ethnic minorities have a higher risk of long-term diabetes complications than whites. Though most of these differences were explained by adjusting for smoking status, socioeconomic status (SES), income, education level, and body mass index (BMI), disparities in processes and outcomes of care remain (Lanting et al., 2005). In addition, Millman et al. (1993) reported that low-income zip codes had four times more diabetes hospitalizations for diabetic ketoacidosis (DKA) and coma per capita than high-income zip codes in 11 states in 1988.

Evidence for Additional Information Supporting Need for the Measure

Ahern MM, Hendryx M. Avoidable hospitalizations for diabetes: comorbidity risks. Dis Manage. 2007 Dec;10(6):347-55. PubMed

American Diabetes Association. Standards of medical care in diabetes - 2013. Diabetes Care. 2013 Jan;36(Suppl 1):S11-66. PubMed

Centers for Disease Control and Prevention (CDC). National diabetes fact sheet, 2011. Atlanta (GA): U.S. Department of Health and Human Services; 2011.

Chen JY, Tian H, Taira Juarez D, Hodges KA, Brand JC, Chung RS, Legorreta AP. The effect of a PPO pay-for-performance program on patients with diabetes. Am J Manag Care. 2010 Jan;16(1):e11-9. PubMed

Cheng SH, Lee TT, Chen CC. A longitudinal examination of a pay-for-performance program for diabetes care: evidence from a natural experiment. Med Care. 2012 Feb;50(2):109-16. PubMed

Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. N Engl J Med. 1993 Sep 30;329(14):977-86. PubMed

Druss BG, Zhao L, Cummings JR, Shim RS, Rust GS, Marcus SC. Mental comorbidity and quality of diabetes care under Medicaid: a 50-state analysis. Med Care. 2012 May;50(5):428-33. PubMed

Lanting LC, Joung IM, Mackenbach JP, Lamberts SW, Bootsma AH. Ethnic differences in mortality, end-stage complications, and quality of care among diabetic patients: a review. Diabetes Care. 2005 Sep;28(9):2280-8. PubMed

MacDonald MR, Jhund PS, Petrie MC, Lewsey JD, Hawkins NM, Bhagra S, Munoz N, Varyani F, Redpath A, Chalmers J, MacIntyre K, McMurray JJ. Discordant short- and long-term outcomes associated with diabetes in patients with heart failure: importance of age and sex: a population study of 5.1 million people in Scotland. Circ Heart Fail. 2008 Nov;1(4):234-41. PubMed

Millman M. Committee on monitoring access to personal health care services. Washington (DC): National Academy Press; 1993.

National Quality Forum measure information: diabetes long-term complications admission rate (PQI 03). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 17 p.

United Kingdom Prospective Diabetes Study (UKPDS). 13: Relative efficacy of randomly allocated diet, sulphonylurea, insulin, or metformin in patients with newly diagnosed non-insulin dependent diabetes followed for three years. BMJ. 1995 Jan 14;310(6972):83-8. PubMed

Wang PH, Lau J, Chalmers TC. Meta-analysis of effects of intensive blood-glucose control on late complications of type I diabetes. Lancet. 1993 May 22;341(8856):1306-9. PubMed

Ward MM. Access to care and the incidence of end-stage renal disease due to diabetes. Diabetes Care. 2009 Jun;32(6):1032-6. PubMed

Extent of Measure Testing

Reliability Testing

The developer's metric of reliability is the signal to noise ratio, which is the ratio of the between county (area) variance (signal) to the within county (area) variance (noise). The formula is signal / (signal + noise). There is an area-specific signal to noise ratio, which is used as an empirical Bayes univariate shrinkage estimator. The overall signal to noise ratio is a weighted average of the county (area)-specific signal-to-noise ratio, where the weight is [1 / (signal + noise)^2]. The signal is calculated using an iterative method. The analysis reports the reliability of the risk-adjusted rate (before applying the empirical Bayes univirate shrinkage estimator).

Overall the risk-adjusted rate is highly reliable. Based on a norm of a signal-to-noise ratio of 0.80, 80% of counties (areas) exceed the norm. Reliability is less than the norm in counties (areas) with population less than approximately 3,000 persons, meaning that the performance score is reliability adjusted closer to the shrinkage target in those counties (areas).

Validity Testing

The developer conducted construct validity testing to examine the association between the risk-adjusted rate and area structural characteristics potentially associated with quality of care, including prior performance, using regression analysis.

Given the stated rationale, the expectation for the regression analysis given the expected relationship between the "Less Access to High Quality Outpatient Care" construct validity measure (F1) and the county (area) risk-adjusted rate is a positive, statistically significant coefficient. The expectation for the regression analysis given the expected relationship between the "More Market Competition" construct validity measure (F2) and the county (area) risk-adjusted rate is a positive, statistically significant coefficient. The results are consistent with expectations. Also, past performance is a moderate predictor of current performance with a coefficient of 0.74.

Refer to the original measure documentation for additional measure testing information.

Evidence for Extent of Measure Testing

National Quality Forum measure information: diabetes long-term complications admission rate (PQI 03). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 17 p.

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Ambulatory/Office-based Care

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Regional, County or City

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Age greater than or equal to 18 years

Target Population Gender

Either male or female

National Framework for Public Health Quality

Public Health Aims for Quality

Population-centered

Risk Reducing

Vigilant

National Strategy for Quality Improvement in Health Care

National Quality Strategy Priority

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Not within an IOM Care Need

IOM Domain

Not within an IOM Domain

Data Collection for the Measure

Case Finding Period

The time period is one year.

Note: The reference population rates and signal variance parameters assume a one-year time period.

Denominator Sampling Frame

Geographically defined

Denominator (Index) Event or Characteristic

Geographic Location

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions

Population ages 18 years and older in metropolitan area (MA) or county. Discharges in the numerator are assigned to the denominator based on the MA or county of the patient residence, not the MA or county where the hospital discharge occurred.

Note:

> The term MA was adopted by the United States (U.S.) Census in 1990 and referred collectively to metropolitan statistical areas (MSAs), consolidated metropolitan statistical areas (CMSAs), and primary metropolitan statistical areas (PMSAs). In addition, "area" could refer to either 1) Federal Information Processing Standard (FIPS) county, 2) modified FIPS county, 3) 1999 Office of Management and Budget (OMB) Metropolitan Statistical Area, or 4) 2003 OMB Metropolitan Statistical Area. Micropolitan Statistical Areas are not used in the Quality Indicator (QI) software.
> The denominator can be specified with the diabetic population only and calculated with the SAS QI software through the condition-specific denominator at the state-level feature.

Exclusions

Unspecified

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions

Discharges, for patients ages 18 years and older, with a principal International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code for diabetes with long-term complications (renal, eye, neurological, circulatory, or complications not otherwise specified)

Note:

> By definition, discharges with a principal diagnosis of diabetes with long-term complications are precluded from an assignment of Major Diagnostic Categories (MDC) 14 by grouper software. Thus, obstetric discharges should not be considered in the Prevention Quality Indicator (PQI) rate, though the Agency for Healthcare Research and Quality (AHRQ) Quality Indicator (QI^{TM}) software does not explicitly exclude obstetric cases.
> Refer to the original measure documentation for ICD-9-CM codes. See also the *Prevention Quality Indicators Appendices*.

Exclusions

Exclude cases:

- Transfer from a hospital (different facility)
- Transfer from a Skilled Nursing Facility (SNF) or Intermediate Care Facility (ICF)
- Transfer from another health care facility
- With missing gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing), principal diagnosis (DX1=missing), or county (PSTCO=missing)

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Proxy for Health State

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Does not apply to this measure (i.e., there is no pre-defined preference for the measure score)

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

The predicted value for each case is computed using a hierarchical model (logistic regression with area random effect) and covariates for gender and age (in 5-year age groups). The reference population used in the regression is the universe of discharges for states that participate in the Healthcare Cost and Utilization Project (HCUP) State Inpatient Data (SID) for the year 2010 (combined), a database consisting of 46 states and approximately 38 million adult discharges, and the United States (U.S.) Census data by county. The expected rate is computed as the sum of the predicted value for each case divided by the number of cases for the unit of analysis of interest (i.e., area). The risk adjusted rate is computed using indirect standardization as the observed rate divided by the expected rate, multiplied by the reference population rate.

Standard of Comparison

not defined yet

Identifying Information

Original Title

PQI 3: diabetes long-term complications admission rate.

Measure Collection Name

Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

Measure Set Name

Prevention Quality Indicators

Submitter

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Developer

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Funding Source(s)

Agency for Healthcare Research and Quality (AHRQ)

Composition of the Group that Developed the Measure

The Agency for Healthcare Research and Quality (AHRQ) Quality Indicator (QI) measures are developed by a team of clinical and measurement experts in collaboration with AHRQ. The AHRQ QIs are continually updated as a result of new research evidence and validation efforts, user feedback, guidance from the National Quality Forum (NQF), and general advances in the science of quality measurement.

Financial Disclosures/Other Potential Conflicts of Interest

None

Endorser

National Quality Forum - None

NQF Number

not defined yet

Date of Endorsement

2014 Sep 18

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2015 Mar

Measure Maintenance

Measure is reviewed and updated on a yearly basis

Date of Next Anticipated Revision

Spring 2016 (version 6.0, including International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10-CM] and International Classification of Diseases, Tenth Revision, Procedure Coding System [ICD-10-PCS] compatible software)

Measure Status

This is the current release of the measure.

This measure updates previous versions:

AHRQ QI. Prevention quality indicators #3: technical specifications. Diabetes long-term complications admission rate [version 4.4]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 2 p.
AHRQ quality indicators. Prevention quality indicators: technical specifications [version 4.4]. Appendices. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 6 p.

Measure Availability

Source available from the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators (QI) Web site .

For more information, contact the AHRQ QI Support Team at E-mail: QIsupport@ahrq.hhs.gov; Phone: 301-427-1949.

Companion Documents

The following are available:

AHRQ quality indicators. Prevention quality indicators (PQI) parameter estimates [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 21 p. This document is available from the AHRQ Quality Indicators Web site .
AHRQ quality indicators. Prevention quality indicators benchmark data tables [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 9 p. This document is available from the AHRQ Quality Indicators Web site .
AHRQ quality indicators. Prevention quality indicators (PQI) composite measure workgroup. Final report. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2006 Apr 7. various p. This document is available from the AHRQ Quality Indicators Web site .
HCUPnet: a tool for identifying, tracking, and analyzing national hospital statistics. [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); [accessed 2015 Sep 10]. HCUPnet is available from the AHRQ Web site .

NQMC Status

This NQMC summary was completed by ECRI on December 19, 2002. The information was verified by the Agency for Healthcare Research and Quality on January 9, 2003.

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Copyright Statement

Production

Source(s)

AHRQ QI research version 5.0. Prevention quality indicator 3 technical specifications: diabetes long-term complications admission rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 2 p.

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